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**DETERMINANTS** 

**OF** 

EMPLOYMENT GROWTH IN

**EGYPT:** 

THE DOMINANT

**ROLE OF** 

AGRICULTURE AND THE RURAL SMALL-SCALE

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We view this effort as a step on the road to understanding the causes of employment growth in Egypt and look forward to assistance in further developing the approach.

Dr. James Norris read the report thoroughly and found some errors in Appendix C of the originally distributed version of the report. For this we are very grateful. This version corrects those errors and some typographical errors in three of the text tables. None of the analysis or conclusions are affected by these corrections, as the text was written on the basis of the correct results. The errors entered the tables afterward during final production of the report.

#### **EXECUTIVE SUMMARY**

Recent cross-national and inter-temporal studies of growth show that in low- and middle-income countries, the direct and indirect effects of agricultural growth account for the bulk of job formation and poverty reduction. Egypt has an unusually productive agricultural resource base and therefore unusual capacity to achieve the rates of agricultural growth that can greatly increase job formation.

This study divides the Egyptian economy into three sectors particularly relevant to employment growth. The first is agriculture. Second is the agriculturally-driven non-agricultural sector (ADNA), which is effectively the bulk of rural and market town small-scale enterprises for which farmers are the underlying source of demand, largely consumption goods and services, but including input supply and marketing. Third is the autonomous non-agricultural sector, which is effectively the rest of the economy, largely the metropolitan activities of manufacturing and government and attendant services. Estimates are made of the size, growth rates and employment of these sectors in the initial period (1996/97). Growth rates are projected from 1996/97 to 2006/07 and the impact on employment measured.

The accounting framework developed for this study traces the effect of a high growth rate in both the agricultural sector and the autonomous non-agricultural sector. That growth rate reaches 8.2% by 2006/07, growing at a pace consistent with an extrapolation of the World Bank's high projection of 7.5% by 2004/05. The agricultural growth rate of 4.9% is comprised of rapid growth in horticulture and livestock, sufficient to meet rapidly growing domestic demand for horticulture and livestock and some exports for horticulture, as well as a moderate growth rate in field crops. Such favorable growth rates require conducive policies and institutional development.

In this scenario with high, sectorally balanced growth, annual additions to employment reach 924,000 by the end of the period (2006/07), assuming constant elasticities of employment for each sector over the decade. As the surplus labor force is absorbed, real wage rates should rise, boosting incomes for lower income people as they benefit from both more employment and higher wages.

Forty-four percent of the 924,000 jobs created in the final year of the analysis are created in the autonomous non-agricultural sector. Of the rest, 26% are directly in the agricultural sector while 74% are the result of increased agricultural incomes stimulating growth in the highly labor-intensive rural and small-town sector (ADNA). Farmers enlarge their houses, buy local furniture and garments and use far more local services as their incomes rise. The high employment content of that sector then causes massive employment increases. This is the same phenomenon noted in the fast-growth countries of Asia.

The impact of agricultural growth on employment is shown by constraining the horticultural and livestock growth rates to three percent and assuming no future acceleration of rates of technological improvements. Such would be the effect of failing

to make necessary policy and institutional changes to the production and marketing environment surrounding agriculture. In this case, employment growth would fall 42% below the high balanced growth scenario (533,000 versus 924,000). That is the difference between substantially exceeding labor force growth rates with consequent increasing real wages and falling substantially short of labor force growth with declining real wages. Constraining agricultural growth only reduced the GDP growth rate by 6% because the sector is a small and declining part of GDP. Indeed, even in the high balanced growth scenario, agriculture declines in ten years from 16% of GDP to 11%, as is normal in fast-growth economies. The sum of the agriculture and agriculturally driven sectors declines from 32% of GDP to 23%. These two sectors are so employment-intensive that they dominate employment growth.

The accounting framework also permits a test of the importance of autonomous non-agricultural growth to GDP and employment. When autonomous non-agricultural growth is constrained to 5%, the overall GDP growth rate declines 41% (to 4.8%), while employment growth falls by 38% (to 572,000). The large impact of the autonomous sector on employment occurs because the sector generates much of the effective demand for the livestock and horticultural products that stimulate agricultural growth. Until greater demand for livestock and horticultural exports can be developed, domestic demand will remain essential to fast growth.

Thus, high growth rates in the agriculturerelated sectors (agriculture and ADNA) are essential to high employment growth rates, and high non-agricultural growth is essential to high rates of agricultural growth. As long as much of the economy remains non-tradable (i.e., dependent on domestic demand), balanced growth will be important.

The accounting framework was also used to compute the employment impact of moderate balanced growth rates in the various sectors. In that case, agriculture grows at 3.6% and the autonomous sector at 7.0%. Although the employment growth is faster than in either of the two more constrained cases, it still falls far short of what will be needed to tighten the labor market. Thus, if Egypt is to absorb a swelling number of new entrants to the labor force, it needs to achieve rapid growth in both its agricultural and non-agricultural sectors. That is a major challenge, but not an impossible one.

The emphasis of recent years on agricultural policy reform has been well placed. Achieving the high growth rates in agriculture essential to generating employment requires continuation of those reforms and their fine-tuning to subsector needs. Rapid agricultural growth is also dependent on the rapid evolution of institutions that support small-farm agriculture, and particularly in the livestock and horticultural subsectors.

#### 1. INTRODUCTION

The structure of economic growth matters. Recent cross-national and inter-temporal studies of growth show that in low- and middle-income countries, growth in agriculture and the associated small-scale sector are the primary forces in reducing poverty and creating jobs. Structures of growth that capitalize on the direct and indirect role of agriculture in creating employment have the greatest impact on reducing poverty. They represent pro-poor growth. When agriculture languishes, overall growth does not increase employment enough to keep ahead of labor force growth and hence does not reduce poverty.

Employment is a critical issue for Egypt because of: (1) current high levels of open unemployment; (2) rapid growth of the labor force, related to past high population growth rates; (3) current redundancy of employment by open market standards in the large-scale manufacturing and service sectors; (4) likely decrease in numbers of migrants abroad and in any case no further increase in the rate of such migration; and, (5) the close relation between employment growth and poverty reduction.

Egypt has unusually large capacity for response to policy reform. Its long history of inward-looking development combined with an emphasis on detailed state allocation of resources and the dominance of state enterprises has led to considerable inefficiencies that are now being removed. Recent and ongoing macro and sectoral reforms will continue to affect the GDP growth rate and employment, with different impacts on each economic sector. In particular, agriculture benefits immensely from macroeconomic policy reforms which improve its terms of trade, but it also requires reforms specific to its own production and marketing processes, as well as substantial institutional development. Without that combination of efforts, agricultural growth will stagnate, and as shown in this analysis, so too will employment growth and poverty reduction.

Egypt is a country with an extraordinarily productive agricultural resource base with respect to soils, climate, and water resources. It has an unusual capacity to expand its agricultural sector through intensification as well as increased cultivated area. Egypt can achieve rates of growth in agriculture substantially faster than the average of all low-income countries, more like Thailand, Kenya and Indonesia in the 1970's and 1980's (Mellor, 1992).

This paper examines the relationships between the structure of growth and employment in Egypt. The analysis provides an empirical basis for assessing the impact on employment of furthering agricultural sector reforms and institutional development. The Monitoring, Verification and Evaluation Unit (MVE) now assesses the specific impacts of the Agricultural Policy Reform Program (APRP) on particular sector-specific indicators. That work can now be expanded to cover the employment impact of those reforms. The paper presents an accounting framework specific to Egypt that allows complex relations among sectoral growth rates to be traced through to their employment

impact. It divides the economy into three sectors: (1) an agricultural sector (termed agriculture) that is disaggregated into three subsectors; (2) an employment-intensive, rural and market town, small-enterprise sector for which the effective demand comes from agriculture (termed agriculture-driven non-agriculture, or ADNA); and (3) an urban, large-scale sector with its associated small-scale and services components (termed autonomous non-agriculture).

The sectors are highly complementary. While the autonomous non-agricultural sector grows largely independent of agricultural growth, it has an important effect in driving the agricultural growth. The horticultural and livestock subsectors of agriculture have in the short run slight prospects for absorbing rapid output growth in the export market. But, rapid growth in the autonomous non-agricultural sector has a major impact on overall growth in per capita income, which leads to rapid growth in domestic demand for horticultural and livestock products.

When it grows rapidly, agriculture generates substantial employment because it is so large. But even more importantly, agricultural growth provides the effective demand for a large labor-intensive sector producing largely non-tradable goods and services (ADNA). Under high balanced growth assumptions, that sector provides more than twice as much incremental employment as agriculture. But it plays this role only if agriculture creates the demand for its output.

Thus we describe a highly interdependent economy in which the large sector that is autonomous from agriculture accounts for a high proportion of GDP growth, and the sectors associated with agriculture account for a high proportion of employment growth.

## 2. THE STRUCTURE OF ECONOMIC GROWTH AND EMPLOYMENT: INTERNATIONAL EXPERIENCE

In recent decades, many countries and regions within countries have experienced accelerated growth and poverty reduction under varying economic conditions. Statistical analysis of the relations among growth, the structures of growth, and poverty have provided results that are startling in their magnitudes but fully consistent with already extant theory.

The first such study was done by Martin Ravallion and his colleagues at the World Bank (e.g. Ravallion and Datt, 1996) and analyzed experience in South Asia, followed by further studies of East and Southeast Asia. The second key study was carried out by Peter Timmer (1997) under the auspices of USAID and involved a cross-sectional time series analysis of a larger set of countries, including several from Latin America. The results of the two studies are roughly consistent and complementary, not only with each other but also with previous, less comprehensive data and with earlier conceptual frameworks. We first survey the empirical findings and then provide the explanation of the relationships behind that empirical record. (For a full review of the international data see Mellor, 1999.)

#### 2.1 Empirical Findings

The international experience shows that growth in the urban sector reduces urban poverty only slightly and has no effect on rural poverty. Conversely, growth in the rural sector has a major effect in reducing rural poverty and has a larger effect in reducing urban poverty than does urban growth. Consistent with that, growth in the manufacturing sector reduces poverty little or not at all, while growth in the agricultural sector has a large effect on reducing poverty. Growth in the large-scale services sector has little effect on poverty, while the growth in small-scale services has a substantial effect. <sup>1</sup>

The important poverty-reducing effects of agricultural growth occur with a lag of at least three years. After this lag, agricultural growth increases employment and wage rates and somewhat lowers food prices. All three factors decrease poverty.

Agricultural growth is not effective in reducing poverty when a highly skewed distribution of land allows the rich to capture the benefits of growth in agricultural incomes. This phenomenon was specific to Latin America. None of the Asian or African countries exhibited sufficient inequality in land holdings to diminish the effect of agricultural growth on poverty reduction.

<sup>&</sup>lt;sup>1</sup> In Egypt, we will see that the horticultural and livestock sectors are so important to increased employment and have such limited short run potentials for exports that increased income from manufacturing growth is a crucial source of growth in demand. Hence, manufacturing growth has an indirect effect on employment working through agricultural growth.

In India over one to two decades, the proportion of the population under the poverty line declined by about one-third. In Southeast Asia, in a similar period, the proportion under the poverty line dropped by half. Such dramatic declines in poverty, attributable to agricultural growth, were greater than what could be explained by the magnitudes of employment growth directly in farm production. The evidence suggests that agricultural growth provided large employment multipliers in the non-agricultural sectors.

#### 2.2 Role of Agriculture

Explanation of these data has been with us for a long time (e.g. Mellor 1992, Mellor and Lele, 1972). How does the process work? There are three elements to the explanation: agriculture is large; it produces the goods that dominate the consumption of the poor; and most important, rising incomes in agriculture are the dominant source of demand for the labor-intensive small-scale sector in rural and market towns.

#### 2.2.1 Agriculture is Large

Agriculture is a large sector and naturally generates substantial employment when it grows – both absolutely and relative to the other sectors. However, two features limit the direct impact of agricultural growth on employment. First, in many countries, the agricultural sector tends not to grow as rapidly as other sectors.

Second, agricultural growth is often brought about by technological changes that substantially increase labor productivity. Research indicates that a 10% increase in agricultural production due to improved crop yields leads to only a 3% increase in employment when real wages are increasing and still only a 6% increase in employment when real wages are constant or declining (Rao 1975). Other means of increasing agricultural production have higher elasticities, as will be discussed below.

#### 2.2.2 Agriculture is a Wage Goods Producer

The agricultural sector produces the basic consumption goods of the poor. Food makes up a large portion of the consumption basket for poor households. (Poverty lines are typically drawn assuming that proportion to be about 80%.) Rapid growth in agricultural production forces real food prices to decline to the immense benefit of the real incomes of the poor. The early literature on development in Asia emphasized that the combination of rapid gains in non-farm employment with stagnant agricultural growth led to increased food prices, decreased real wages and the subsequent choking off of non-farm growth (Mellor, 1966). Imports could not stop rising real food prices because food bulked so large in consumption.

#### 2.2.3 Agriculture is a Consumer

As a large sector often consisting of more than half of a nation's population, the agricultural sector offers an important market for the national economy. Furthermore, the

agricultural sector is the primary source of demand for the many small-scale enterprises located in rural and market towns (Mead and Liedholm 1988, Liedholm and Mead, 1987). This agriculturally driven non-agricultural sector (ADNA) produces goods such as rural housing, furniture, local garments, shoes, baskets and so on, as well as a wide range of personal services.

The importance of the ADNA sector is confirmed by three of the facts cited above. First, when agriculture grows rapidly, poverty decline and hence employment growth is far greater than could be explained by agricultural employment alone. Second, there is a lag of two to three years in the response. That is not consistent with the effect coming directly from farm production where the employment increase and food price decrease is instantaneous with the production increase. It is consistent with taking time for expenditure multipliers to work through the system. Third, there is no poverty reduction effect where land distribution is highly skewed. In that circumstance, the direct effect on employment in farm production should not be reduced because rural wages are low in such societies encouraging labor-intensive production. However, the expenditure patterns of the rich landowners are skewed toward high-import-content and capital-intensive goods. That is in contrast to peasant farmers' expenditures patterns and thus explains the difference in expansion of employment in the agriculturally driven non-agricultural sector.

#### 3. METHODOLOGY

This study traces the potential effects of policy-related assumptions on economic growth and employment by sector through fiscal year 2006/07.

The analysis is carried out in four analytically distinct steps. First, sectors relevant to job creation are identified both conceptually and numerically in GDP and employment statistics. Second, GDP growth rates by sector are projected into the future. Third, employment for each of the key sectors is estimated from the sector-specific GDP growth rate projections. Fourth, the underlying assumptions are altered to explore alternative economic and employment growth scenarios. These steps are carried out in a spreadsheet using an accounting framework based on arithmetic links between time periods and sectors. The links incorporate elasticities and growth rates.

The analysis covers the decade from fiscal year 1996/97 to fiscal year 2006/07. (Egypt's fiscal year runs from July 1<sup>st</sup> to June 30<sup>th</sup>). Following general macroeconomic reforms instituted in the early 1990s, the Agricultural Policy Reform Program (APRP) was instituted in 1996/97. The analysis extends to 2006/07 to permit the effect of fully implemented reforms on economic and employment growth to mature and stabilize.

The primary data are taken from official Egyptian sources. Where specific figures are unavailable, reasonable approximations have been drawn from local surveys conducted by the International Food Policy Research Institute (IFPRI) in 1997, corroborated by the international literature. The key data, derivations and assumptions are included in Appendices A and B. The details of the accounting framework are laid out in Appendix C.

#### 3.1 Identifying the Sectors

Following the evidence outlined in chapter 2, the dynamics of economic growth and employment are expressed in a three-sector model of the Egyptian economy. The sectors are defined to focus on the capacity for agriculture to stimulate employment:

- Agricultural sector, defined as the value of goods and services generated from crop, livestock and fisheries and forestry activities.
- Agriculturally-driven non-agricultural sector (ADNA), defined as the value of goods and services produced in small-scale enterprises in non-metropolitan areas the demand for which is derived from expenditure of agricultural incomes. Both consumption goods and production goods such as inputs and marketing services are included. (See Box 1 for a fuller description.)
- Autonomous Non-Agricultural sector defined as the value of all other components of GDP.

Thus the size of each sector is equal to the value of a specific set of goods and/or services, but each is measured in a different way. The agricultural sector is the usual one,

comprising a set of farm outputs produced over the course of one agricultural year. To measure ADNA requires allowing several rounds of expenditure multipliers to play themselves out. In doing so, they identify a set of goods and services. These are added to small-scale input and marketing services for agricultural products to define ADNA. The autonomous non-agricultural sector is then measured as the rest of the economy.

#### 3.1.1 Partitioning the Economy

The available GDP data for sector size are partitioned into the three sectors for the initial period (1996/97). The key assumptions and data underlying the calculations are included in Appendix A. The steps are as follows:

- The size of the agricultural sector is determined from empirical data (16%).
- The size of the ADNA sector is determined by how much the agricultural sector spends on the goods and services produced by ADNA and subsequently, how much of the agriculture derived income the ADNA sector then spends on its own goods and services (i.e., the multiplier). Approximately half of all spending by the agricultural sector is determined to be on goods and services produced by ADNA<sup>2</sup>. The ADNA sector is assumed to spend the revenues it receives from the agricultural sector in roughly the same manner as the agricultural sector, half on itself, and half leaking to the other two sectors <sup>3</sup>. This process repeats until the initial infusion from the agricultural sector runs its course, growing smaller with each iteration and generating an ADNA sector approximately equal in size to the agricultural sector (16% of GDP)<sup>4</sup>.
- The size of the autonomous sector is computed as the residual (64%), consistent with its definition.

<sup>2</sup> The agricultural sector purchases both consumer and producer goods and services from ADNA. IFPRI data from the 1997 household survey indicate that 43% of all consumer spending by the agricultural sector is for nonfood goods and services, of which 90% is assumed to be produced by rural and market towns (i.e., ADNA). Another 11% of total agricultural sector incomes is assumed as producer spending for inputs and marketing services, estimated from MALR farm gate prices and CAPMAS retail prices as 23% marketing margins, of which 50% is produced by ADNA. The sum of consumer and producer spending by the agricultural sector on ADNA goods and services is therefore 50.2% (.9\*43% plus .5\*23%). This figure is rounded to 50%. For corroborating international data, see Hazell and Roell (1983) and Delgado et al (1998).

$$0.5*16\% + (0.5)^2*16\% + (0.5)^3*16\% + \dots + (0.5)^n*16\%$$

and the sum of the factors of 16% here is one.

<sup>&</sup>lt;sup>3</sup> Expenditures in the agricultural sector are previously included in that sector's initial revenues and are thus not double counted here.

<sup>&</sup>lt;sup>4</sup> These spending patterns imply that ADNA is as big as agriculture. The initial infusion dwindles as follows:

#### What is the ADNA sector and why is it so large?

The agriculturally driven non-agricultural sector (ADNA) does not appear in the usual categories of GDP subsectors but nevertheless deserves special attention because of its potential for creating jobs and the source of its demand.

The ADNA sector is defined from an employment and demand point of view. It is labor-intensive and produces goods and services that are largely non-tradable, but purchased by farmers. Increased foreign trade will not greatly enlarge demand for ADNA products, but increased agricultural incomes will. House construction in rural areas, for example, is labor-intensive and expands with increases in local, rather than foreign incomes. The same is true of garments made for the local market - turning those small-town firms into suppliers of international fashion is of course possible, but will take a long time.

In order of importance in Egypt (Davies et al. 1992), ADNA manufacturing enterprises include dairy product processors, tailors, dressmakers, mat makers, hat makers, furniture makers, shoe makers and tile producers. It also includes locally produced and consumed services such as those rendered by construction workers, small traders, rural transporters, teachers and health workers. Local small-scale agribusiness is included in the ADNA sector (such as the labor-intensive local enterprises for input and output marketing and local processing); however many of the more capital-intensive, tradable agribusiness activities such as fertilizer production are not ADNA. They are fully tradable and hence local demand is not a determinant of their expansion. They also generate little incremental employment. Overall, consumer goods and services are on the order of three times as important as the agribusiness components of ADNA (Hazell and Roell 1983.)

Agriculture is important as a source of demand for ADNA. That is because agriculture is so large to start with, because farmers have consumption patterns that favor the quality and price of ADNA goods and services, and because farmers have high marginal propensities to spend on such items (Hazell and Roell 1983, Delgado 1999, see also Mead and Liedholm 1988). They spend much more of increments to income on ADNA goods and services than of the base income. Income and expenditure figures from the 1997 IFPRI household survey (Bouis et al., 1999) suggest the ADNA sector in Egypt is as important as agriculture in GDP and relatively more important in employment.

But, there is much more to it than that. The labor force in ADNA is large. When rising agricultura incomes drive up the demand for ADNA output, ADNA incomes rise. These small entrepreneurs and laborers spend like farmers and hence when driven by agricultural incomes, they will further increase the demand for output for their own sector. As long as labor is elastic in supply, this sector will expand employment roughly pari passu with demand increase. Liedholm and Mead 1987 emphasize the high-income elasticities of demand for the bulk of these products.

Egypt's ADNA sector is comparable in size to all the non-farm enterprise in rural areas plus about 20% of that in the towns smaller than the metropolitan areas. It will include the bulk of the market town enterprises. This definition of the ADNA sector is consistent with the literature on small firms, e.g. by Davies et al. for Egypt (1992) and the international literature, e.g. Liedholm and Mead (1987).

#### 3.1.2 Partitioning Growth Rates

GDP data for sectoral growth rates are partitioned into the three sectors for the initial period (1996/97. The key assumptions and data underlying these calculations are included in Appendix A. The steps are as follows:

- The growth of the agricultural sector is taken from empirical data (3.4%).
- The growth of the ADNA sector is assumed to be determined by demand, which in turn is equal to the population growth rate plus per capita agricultural sector growth, adjusted by a multiplier of 1.5 for the usual ratio of growth between ADNA and agricultural sectors<sup>5</sup> (4.1%).
- The growth of the autonomous sector is computed as the residual growth required for the economy to have achieved the published growth rate of 5.3% in 1996/97 (6.0%).

#### 3.1.3 Partitioning Employment

The total employment figure of 15.8 million for 1996/97<sup>6</sup> is divided between the sectors using the results of local studies and official data.

- Agricultural employment is initially 26% (4.1 million) of total employment based on the results of the 1997 IFPRI household survey for the proportion of the surveyed population reporting its principal occupation as farming plus casual labor in agriculture (unpublished data). This is a conservative assumption compared to CAPMAS data for agricultural employment of 31%.
- ADNA employment is initially 34% (5.3 million) of total employment. Its share is taken as 130% of agricultural employment <sup>7</sup>.
- Autonomous employment is initially 40% (6.4 million) of total employment. Its share is computed as the residual of total employment minus employment in the two agriculture-related sectors.

<sup>5</sup>The 1.5 multiplier is in effect an elasticity of expenditure for the agricultural sector for ADNA goods and services. The 1997 IFPRI data (Bouis et al., 1999) show an elasticity of expenditure on non-food goods and services for rural Egypt of 1.83, which we conservatively reduce to 1.5. The multiplier of 1.5 for Egypt is the same as that from studies by Hazell et al., (1983) and by Mellor (1992); the former a micro study for Malaysia, the latter a cross-sectional study of Asian countries.

<sup>7</sup> We assume that 1) incomes in each sector reflect the returns to the labor and non-labor factors of production employed and 2) incomes of farmers reflect agricultural incomes, and the incomes of non-metropolitan non-farmers reflect the incomes of ADNA sector employees. Given that both sectors earn the same total product (as indicated by their equal GDP shares) and farmer incomes are 30% larger than for ADNA incomes, (according to the 1997 IFPRI household survey), then there must be 30% more workers in the ADNA sector than in the agricultural sector. In other words, with the same GDP and 30% higher GDP per capita in agriculture, there must be 30% more workers in ADNA.

<sup>&</sup>lt;sup>6</sup> The Statistical Year Book, Central Agency for Public Mobilisation and Statistics.

#### 3.2 Projecting GDP

Once the 1996/97 data for GDP is partitioned into the three sectors, those components are projected forward to FY 2006/07 based on simple identities combined with assumptions about the growth for each sector. The linkages between the sectors are laid out in Figure 1, below. The particular dynamics internal to each sector are described using the set of parameters needed for Egypt to obtain rapid economic growth (i.e., the high balanced growth scenario). Other scenarios are described in chapter 4.

First, sector shares are projected forward one period based on the last period's sector shares and growth rates. Second, sector growth rates are computed based on last period's economic growth and technical assumptions. Finally, GDP growth is calculated for the total economy.

#### 3.2.1 Sector Shares

The first step in projecting GDP growth rates is to determine the relative size (share) of each subsector at the beginning of the given period. The sector share in the given period is defined as:

$$Share_{it} = \frac{Share_{i,t-1} * (1 + GDP_{i,t-1})}{\sum_{i} Share_{i,t-1} * (1 + GDP_{i,t-1})}$$

where i = sector, t = year and  $\overrightarrow{GDP}$  is the rate of change in real GDP between years.

#### 3.2.2 Sector Growth

As indicated in figure 1, GDP growth in a given period is the sum of growth in the three component sectors: agriculture, ADNA and autonomous non-agriculture. Overall, GDP growth in one period stimulates growth in agriculture (through its subsectors) and in the autonomous sector in the next. Agricultural sector growth gives rise to ADNA sector growth in the same period. Ultimately, agriculture has a dual effect on GDP growth, directly and indirectly through ADNA. The autonomous sector in turn influences agriculture (and thus ADNA) through its contribution to GDP.

**Agricultural Growth.** The growth rate of the agricultural sector is determined by the growth rate of each of its component subsectors (field crops, horticulture and livestock), weighted by their sector shares. GDP in period t drives the horticulture and livestock sectors. That is because they produce largely non-tradables (in the short run quality and institutional limitations restrain them to the domestic market) with a perfectly elastic supply. The determinants of subsector growth are as follows:

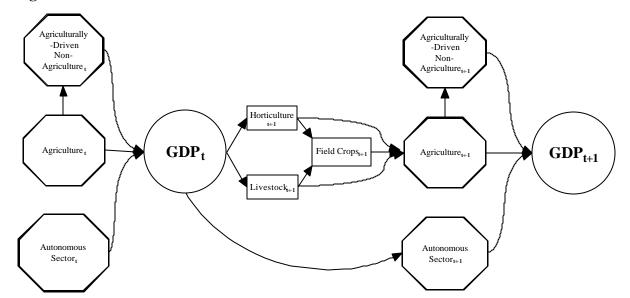


Figure 1: Links between Sector Growth Rates

- Horticultural subsector growth is assumed to be driven by the demand for horticultural products, with horticultural supply shifting to meet that newly generated demand. Domestic demand (95%) is determined by population growth and the marginal propensity to consume horticultural products based on previous period GDP growth and an income elasticity of .67 (Bouis et al., 1999). As discussed previously, growth of the autonomous non-agricultural sector is important to national income growth and hence to demand for the horticultural sector. Export demand (5%) is assumed to grow at a constant rate of 10% per annum. 8
- Livestock subsector growth is assumed to be driven by the demand for livestock products with livestock supply shifting to meet demand. Livestock demand is wholly a function of domestic influences and depends on population growth and the marginal propensity to consume livestock products based on previous period GDP growth and an income elasticity of .77 (Bouis et al., 1999; see Appendix A for fuller detail). As for horticulture, growth of the autonomous non-agricultural sector is important to livestock demand.
- Field Crops subsector growth is assumed to be driven by the technical constraints that determine supply, namely area and value of output per unit area. The field crop sector is supply-driven since production is largely tradable. In fact, Egypt already trades wheat, rice, maize and cotton in international markets. The gross increase in area of 1.69% a year<sup>9</sup> is reduced by the loss of area to increased horticultural and livestock activities. Horticultural and livestock areas in turn are determined as the residual of

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<sup>&</sup>lt;sup>8</sup> Egyptian policy reform is designed to assist export growth. To succeed requires that domestic demand be met. Otherwise real domestic prices will continue to rise, pricing Egypt out of the export market.

<sup>&</sup>lt;sup>9</sup> Estimated from MALR data (Central Administration for Agricultural Economics) for old and new lands from 1991 to 1997.

their GDP growth rates less value-enhancing increases in yields (for fodder crops in the case of livestock) and composition (for horticulture) and feeding efficiency (for livestock).

The projection assumes that the yields growth rate for field, horticultural and fodder crops accelerates from the 0.4% of the past to 1.0% for the future. The United States averages about a 1.5% rate of growth of yields off a base yield level higher relative to its resource base than Egypt. Even so, this is not an easy target to meet, requiring improvement in the research and extension system. It would be excessively optimistic to think the institutional structure for yield growth could improve substantially more than this.

Similarly, it is assumed that the composition of field crop production will increase the value of output per hectare gradually increasing from a current contribution of zero to 1.0% per year at the end of the period. A higher composition effect is posited for horticulture (from zero to 2%) due to the current preponderance of potatoes and scope to move to higher-value crops. Gains in the value of livestock per hectare of fodder crops are proposed to accelerate from zero to 3% over the ten-year period with improved feeding efficiency.

**ADNA Growth.** The growth rate of the ADNA sector is demand-driven, derived from the agricultural sector growth rate in the same manner described in section 3.1.2 above. Because ADNA produces non-tradables, it can grow only to the extent that agriculture provides effective demand. It has a perfectly elastic supply response to growth in agricultural demand. Thus we are assuming that the policy environment for these enterprises is also significantly improved by policy reforms.

**Autonomous Non-Agricultural Growth.** The autonomous sector is assumed to grow at 9% per annum, a rate somewhat lower than that achieved by the East Asian Tigers and Southeast Asia. No attempt is made to determine the growth rates for the subsector components of this large sector. To achieve a 9% growth rate in the autonomous sector will require vigorous attention to policy reform and the institutional development of trade. Neither the agricultural or ADNA sectors influence autonomous sector growth. This sector produces tradables for sale on international markets, irrespective of domestic demand, and non-tradables for sale domestically, to satisfy the demand of the autonomous sector. <sup>10</sup>

The autonomous sector, however, is a major consumer of products from the agricultural sector. Rising autonomous incomes stimulate demand not only for staple foods but also increasingly for superior goods such as milk, meat, vegetables and fruits. Thus agricultural growth is itself strongly dependent on the growth of the autonomous sector.

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<sup>&</sup>lt;sup>10</sup> A case in point is fertilizer. It is irrelevant to the fertilizer industry whether domestic demand grows or not because fertilizer is a fully tradable commodity which can be sold domestically or internationally on a fully interchangeable basis. In Egypt the fertilizer industry has exported its products but does not yet have complete freedom to export whenever it wishes.

#### 3.2.3 Total Growth

Using formulas for simple weighted averages, total economic growth in a given period  $(GDP_t)$  is equal to the sum of the growth rates of each of the component sectors for that period  $(GDP_{it})$  weighted by the sector's share in the economy:

$$\overrightarrow{GDP_t} = \sum_{i} \overrightarrow{GDP_{it}} *Share_{it}$$

An analogous formula is used to determine the growth rate of the agricultural sector based on the growth of its subsectors (field crops, horticulture and livestock).

#### 3.3 Projecting Employment

The calculations described above generate an internally consistent series of GDP growth rates for each of the key sectors and subsectors for the decade from 1996/97 to 2006/07 (11 periods), as well as an initial partitioning of aggregate employment data among the

#### **Elasticities of Demand for Labor**

An elasticity of 1.0 means that labor productivity stays constant. For each one-percent increase in output, one percent more labor will be used. An elasticity of less than one reflects increasing labor productivity. For example, an elasticity of 0.4 means that for each one-percent increase in output, there is a 0.4 percent increase in labor. Rising labor productivity results in fewer jobs from a given growth rate.

three key sectors. The number of jobs added annually in each sector is calculated for each period based on the sector's employment in the last period  $(E_{i,t-1})$ , inflated by a growth factor representing the rate of increase in sector employment  $(\dot{E}_i)$ :

That rate of increase is determined by the elasticity of employment with respect to economic growth multiplied by the sector-specific growth rate:

$$E_{i,t} = (GDP_{i,t} * \mathbf{e}_i)$$

Total sector employment in each period is therefore calculated as:

$$E_{i,t} = (GDP_{i,t} * \mathbf{e}_i) * E_{i,t-1} + E_{i,t-1}$$

ADNA ADNA Sector ADNA Sector Growth Rate Total Agriculture Agriculture Agricultural GDP<sub>t-1</sub> **Employ-**Sector Growth Sector Growth Sector Employment Rate, ment₊ Autonomous SectorGrowth SectorGrowth Sector Employment Rate<sub>t-1</sub>

Figure 2: Links between Sector Growth and Sector Employment

where the elasticity of employment is .65, .9 and .4 for the agricultural, ADNA and autonomous sectors, respectively<sup>11</sup>. These relationships are captured in Figure 2, which follows from Figure 1, by illustrating how sector-specific GDP growth rates are converted into employment using multipliers for each sector.

<sup>11</sup> Precise estimates for the elasticities of employment with respect to GDP growth are not currently available for the Egyptian economy. Proxy measures have been derived from a combination of national and international data. Employment is, by implication, for all full-time equivalents of labor.

- Agriculture: the elasticity of 0.65 is derived from a simple average of 1) 0.45 for field crops, arbitrarily set at the mid point of the 0.6 to 0.3 range from Rao, 1975, for the effect of yield increase on employment, which is conservative given Egypt's under-employment; 2) 0.8 for new lands on the assumption that labor use is modestly higher than on the old lands due to larger farm size; 3) 0.7 for horticulture on the assumption that much of the expansion comes from area increase; and 4) 0.7 for livestock on the assumption that labor productivity increases modestly with increased livestock production.
- ADNA: the elasticity of 0.9 is based on the assumption that output growth comes from increased demand not from technological change and therefore labor productivity does not increase much with growth until wage rates begin to rise with full employment.
- Autonomous: the elasticity of 0.4 reflects the upper bound of empirical data for that sector and what
  might happen at best when the currently redundant labor force has been absorbed after a few years of
  rapid growth.

The validity of these employment elasticities in the Egyptian context was tested by applying them historically. An employment elasticity of 0.6 was substituted for 0.4 for the autonomous sector to reflect the Government's earlier commitment to hire all graduates into public service. The combination of these sector-specific elasticities and historic sector growth rates in the model matched the official employment figures within 1% for each year of the decade preceding the study (1986/87 through 1995/96).

#### 4. RESULTS

The basic model described in the equations and figures above was estimated under four different sets of assumptions concerning sector growth rates. Changing some of the model's key parameters provides a measure of the costs of not improving productivity-enhancing policies in terms of economic growth rates and job creation. The first set of assumptions (high balanced growth) defines what can be accomplished in GDP and employment growth if high rates of growth are achieved in all sectors. Hence, unlike most of the assumptions in the rest of the analysis, these growth rates are not conservative estimates. They identify the rates of economic and employment growth Egypt could obtain if the policy environment allowed the country to maximize the potential of its generous agricultural resource base. Realistic assumptions are made about the technical parameters (such as growth in yields or improved value of crop composition) that result from good macro, sectoral, and institutional development policies.

The three alternatives illustrate the effect of a general dampening of growth in all sectors (moderate balanced growth) and the different effects of unbalanced growth (low agricultural growth and low autonomous sector growth). The differences in the assumptions underlying these scenarios are described in the relevant sections below and summarized in Appendix B.

#### 4.1 High Balanced Growth

The high balanced growth scenario, consistent with the assumptions explained in chapter 3 as well as Appendices A and C, represents Egypt's potential for strong economic growth, based on an enabling policy environment. Table 1 contrasts the actual growth rates in the initial period (1996/97) with those computed for 2006/07 according to the high balanced growth assumptions. Table 2 presents the growth of employment for those sectors.

#### 4.1.1 GDP

Under a favorable policy environment, the economy can attain a real GDP growth rate of 8.2% by FY 2006/07. This rate is comparable with the World Bank's high projection which shows annual increments to the growth rate of 0.5%, reaching 7.5% in 2004/05, which projected two more years would reach 8.5% (World Bank, 1997).

With reasonable technological advances, Egypt's agricultural sector should be able to achieve a 4.9% annual growth rate by FY 2006/07. That places Egypt in the center of the 4% to 6% range that characterizes countries with rapid agricultural growth (Mellor, 1992). This ambitious rate of growth is realistic if policies are honed to take advantage of Egypt's extraordinarily productive agricultural resources, superb climate, soils and water availability.

The growth rates shown for horticulture and livestock are 6.6%, and 6.8% respectively. Other countries, such as Thailand (Mellor, 1992), meet similar rates of growth of domestic demand plus export growth, so this target should be reasonable. With high growth rates, the agricultural sector's relative size in the economy declines from 16% to 11% within ten years, underscoring the historic phenomenon that the faster agriculture grows, the faster its relative importance declines (Mellor, 1966). Its share of the GDP growth rate declines from 10% at the beginning of the period to 7% at the end, consistent with agriculture's modest place in GDP.

Table 1 indicates that a 4.9% growth rate for the agricultural sector generates a 6.4% growth rate in the ADNA sector. This sector already provides about half the manufacturing employment in Egypt, hence its relatively large role in the economy and even larger role in employment. An intensive review of the literature by Liedholm and Mead (1987) shows demand for this sector is driven by agricultural and rural incomes and that the sector expands readily in response to increased demand. The output is largely too costly relative to quality to be exported and hence growth is constrained by domestic demand. The rapid agricultural growth stimulates a rapid growth in ADNA, although like agriculture, the sector declines in relative importance over time (16% to 12%). Together, the two agriculturally related sectors decline from 32% to 23% of GDP over the ten-year period. As with agriculture, ADNA's share of GDP growth also declines from 12% to 9%.

The autonomous sector dominates the economy and is projected to grow from 69% to 77% of GDP over the decade in the high balanced growth scenario. This dominance reflects Egypt's advanced stage in the process of economic transformation from an agricultural to a non-agricultural economy. The autonomous sector thus plays a critical role in achieving high GDP growth rates. Under the sectoral assumptions outlined in section 3, this sector is projected to provide 84% of GDP growth by FY 2006/07, as compared to only 7% for agriculture alone.

Table 1: High Balanced Growth: GDP by Sector

	Growth	Rates	Share of	of GDP	Share of GDP Growth Rate		
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	
Total	5.3%	8.2%	100%	100%	100%	100%	
Agriculture	3.4%	4.9%	16%	11%	10%	7%	
Field Crops	N.A.	1.6%	47%	34%	N.A.	11%	
Horticulture	N.A.	6.6%	33%	42%	N.A.	56%	
Livestock	N.A.	6.8%	20%	24%	N.A.	33%	
Ag-Driven NonAg.	4.1%	6.4%	16%	12%	12%	9%	
Autonomous	6.0%	9.0%	69%	77%	78%	84%	

Table 2: High Balanced Growth: Employment by Sector

	Number Employed (000)		Share of Employment		Annual Increase (000)		Share of Increased Employment	
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07
Total	15825	22555	100%	100%	500	924	100%	100%
Agriculture	4115	5288	26%	23%	90	164	18%	18%
Ag-Driven NonAg	5349	8201	34%	37%	192	445	38%	48%
Autonomous	6362	9061	40%	40%	220	315	44%	34%

Sources for initial data and key parameters are given in Appendix A. Actual computations are included in Appendix C.

#### 4.1.2 Employment

Table 2 depicts the power of a dynamic economy with strong agricultural performance to generate jobs. The rapid employment gains of 924,000 jobs a year within a decade are consistent with the global literature on poverty reduction achievable under "pro-poor" strategies that stimulate agricultural growth (Timmer, 1997; Ravallion and Datt, 1996).

In the initial year (1996/97) only about 500,000 jobs are added, about 85% of the number of new entrants to the Egyptian labor force <sup>12</sup>. In that context, real wages will continue to decline. After ten years of high growth, 66% of the annual increment in jobs is in the agricultural and ADNA sectors, and 34% are in the autonomous sector. As economic growth accelerates, the annual increment of jobs nearly doubles and exceeds the annual additions to the labor force. Under such conditions, real wages should rise, bringing increased labor productivity particularly in the agriculture and ADNA sectors, which lend themselves to low-cost increases in labor productivity. Half the newly created jobs are in ADNA, thus located in small-scale enterprises in rural areas and small towns. The ADNA sector can thus serve as a vibrant creator of jobs when it enjoys strong effective demand for its output. That only happens when agricultural incomes rise.

This analysis uses constant elasticities of employment for the period from 1996/97 to 2006/07. In a neoclassical world, the elasticities would be higher if employment increases slower than the labor force, thereby depressing real wages. They would be lower if employment increases faster than the labor force. In each case, the apparent elasticity would change enough so the labor force was fully utilized. The mechanism of those changes would be the wage rate change. Our analysis focuses on whether the pressure is for reduction of real wages or increase.

#### 4.2 Low Agricultural Growth (Unbalanced)

Constraining the parameters to show conditions of slow agricultural growth highlights the importance of agriculture-based growth and employment. Tables 3 and 4 show the effect of constraining the growth of horticultural and livestock demand to 3% while assuming no improvement in the value of crop composition or livestock feeding efficiency. Autonomous sector growth is left at the high growth level of 9% (see Appendix B for assumptions). In this unbalanced scenario, the overall agricultural growth rate falls from 4.9% (high balanced scenario) to 2.4% in FY 2006/07. That growth rate is less than current accomplishment. It would represent some backsliding in the current agricultural

<sup>&</sup>lt;sup>12</sup> While estimates of annual additions to the labor force vary considerably, the differences are largely due to different estimates of the labor force size, rather than the growth rates. Since the estimates of employment in this analysis are based on elasticities applied to the base number, any increase in the base number would result in a proportionate increase in the employment generated by the given elasticity. Thus, our comparisons of jobs created by sector, with labor force additions, should hold up regardless of which base labor force figures are taken.

policy reforms and, more important, failure to push ahead with critical institutional reforms.

Despite the near halving of agricultural growth, the steady growth in the large autonomous sector cushions the overall blow to the economy of failing to improve agricultural growth. Total GDP growth is only reduced by 0.5 percentage points (6%), from 8.2% to 7.7%.

Low agricultural growth, however, has a disproportionate effect on employment. Table 4 shows a dramatic decline in job formation, with 42% fewer jobs created than in the high balanced growth scenario. Job creation in the autonomous sector is unaffected by the agricultural slowdown, but the number of jobs created in the ADNA sector plummets by 68% and those in agriculture drop by 56%. That such a small slowdown in GDP growth (0.5 percentage points) brings such a large decline in employment (42%) underlines the importance of agriculture to employment. The structure of growth certainly does matter to employment growth.

**Table 3: Low Agricultural Sector Growth: GDP by Sector** 

	Growth	Rates	Share of	of GDP	Share of GDP Growth Rate		
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	
Total	5.3%	7.7%	100%	100%	100%	100%	
Agriculture	3.4%	2.4%	16%	10%	10%	3%	
Field Crops	N.A.	1.6%	48%	43%	N.A.	28%	
Horticulture	N.A.	3.0%	33%	36%	N.A.	46%	
Livestock	N.A.	3.0%	19%	21%	N.A.	27%	
Ag-Driven NonAg	4.1%	2.6%	16%	10%	12%	3%	
Autonomous	6.0%	9.0%	69%	80%	78%	94%	

**Table 4: Low Agricultural Sector Growth: Employment By Sector** 

	Number Employed (000)		1 0		Annual Increase (000)		Share of Increased Employment	
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07
Total	15825	20275	100%	100%	502	533	100%	100%
Agriculture	4115	4720	26%	23%	90	72	18%	14%
Ag-Driven NonAg	5349	6494	34%	32%	192	146	38%	27%
Autonomous	6362	9061	40%	45%	220	315	44%	59%

Sources for initial data and key parameters are given in Appendices A and B.

#### 4.3 Low Autonomous Sector Growth (Unbalanced)

In the previous scenarios, the autonomous sector was assumed to growth at 9% per year, independent of changes in the agricultural or ADNA sectors. Slowing autonomous sector growth to 5% - such as might happen if current macroeconomic policy reforms are not maintained - greatly affects the economy. GDP growth drops by 41% to 4.8% (Table 5).

In this unbalanced scenario, the agriculture growth rate is left unconstrained, but is so dependent on the horticultural and livestock demand brought about by strong economic growth that its own growth rate comes down by one percentage point to 3.8%. The low growth in the autonomous non-agricultural sector resulted in low growth in per capita income and hence low growth in demand for horticulture and livestock. The net result is a dampening of the overall agricultural growth rate. As a result of the slowdown in autonomous sector growth – and its impact on the other two employment-intensive sectors – total employment growth drops by 38% (Table 6.) Autonomous sector employment drops by one-half with the lower growth rate of the sector. Employment in the two agriculture-related sectors drops by almost one-third. Thus a high growth rate in employment requires balanced growth of the agricultural and non-agricultural sectors.

#### 4.4 Moderate Balanced Growth

As a final scenario, moderate balanced growth is shown for all sectors. Autonomous sector growth is put at 7.0%, the midpoint between the high balanced growth scenario 9.0% and the constrained rate of 5.0% (Table 7). Although the supply of horticulture and livestock products is assumed to meet the demand growth (which would require substantial policy and institutional change) yield increases, cropping intensities, and feeding efficiencies are maintained at the same level as in 1996/97.

With these assumptions, employment increases by 23% from the base year calculation (Table 8). Over the decade, annual increments to the labor force would have grown by much more than that, so even with modest agricultural and autonomous growth, unemployment would increase as real incomes for the laboring classes decreased. Even with these moderate assumptions, however, agriculture directly and indirectly provides 63% of the employment growth.

Table 5: Low Autonomous Sector Growth: GDP by Sector

	Growth	Rates	Share o	of GDP	Share of GDP Growth Rate		
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	
Total	4.6%	4.8%	100%	100%	100%	100%	
Agriculture	3.4%	3.8%	16%	14%	10%	11%	
Field Crops	N.A.	2.8%	48%	40%	N.A.	30%	
Horticulture	N.A.	4.6%	33%	38%	N.A.	47%	
Livestock	N.A.	4.1%	19%	22%	N.A.	23%	
Ag-Driven NonAg	4.1%	4.6%	16%	14%	12%	14%	
Autonomous	5.0%	5.0%	69%	72%	78%	75%	

**Table 6: Low Autonomous Sector Growth: Employment By Sector** 

	Number of Employed (000)		1 0		Annual (00	Increase 00)	Share of Incr. Employment	
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07
Total	15825	20281	100%	100%	502	572	100%	100%
Agriculture	4115	5053	26%	25%	90	121	18%	21%
Ag-Driven NonAg	5349	7473	34%	37%	192	299	38%	52%
Autonomous	6362	7755	40%	38%	220	152	44%	27%

Sources for initial data and key parameters are given in Appendices A and B.

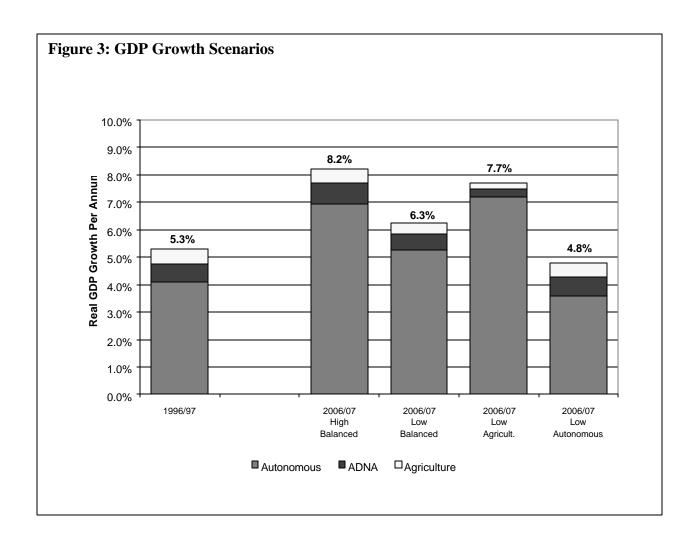
**Table 7: Moderate Balanced Growth: GDP by Sector** 

	Growth	Rates	Share of	of GDP	Share of GDP Growth Rate		
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	
Total	5.3%	6.3%	100%	100%	100%	100%	
Agriculture	3.4%	3.6%	16%	12%	10%	7%	
Field Crops	N.A.	0.4%	48%	35%	N.A.	4%	
Horticulture	N.A.	5.4%	33%	41%	N.A.	62%	
Livestock	N.A.	5.2%	19%	23%	N.A.	34%	
Ag-Driven NonAg	4.1%	4.3%	16%	13%	12%	9%	
Autonomous	6.0%	7.0%	69%	75%	78%	84%	

 Table 8: Moderate Balanced Growth: Employment By Sector

	Number Employed (000)				Annual (00		Share of Increased Employment	
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07
Total	15825	20770	100%	100%	502	618	100%	100%
Agriculture	4115	5018	26%	24%	90	114	18%	18%
Ag-Driven NonAg	5349	7367	34%	35%	192	276	38%	45%
Autonomous	6362	8385	40%	40%	220	228	44%	37%

Sources for initial data and key parameters are given in Appendices A and B.

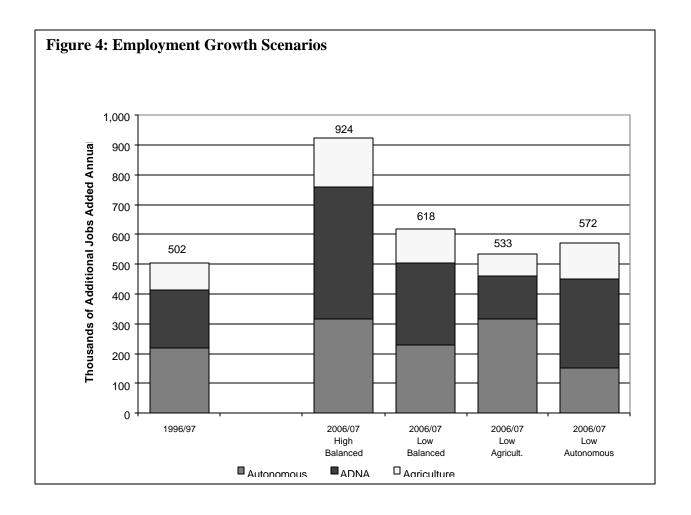


#### 4.5 Comparative Growth and Employment

Figures 3 and 4 facilitate comparison across the four scenarios. Only high rates of growth of both agriculture and the autonomous non-agricultural sector generate sufficient jobs to tighten labor markets, exert upward pressure on wages and stimulate gains in labor productivity. Moderate assumptions are not enough to move ahead of the present situation relative to labor force additions.

Low growth in the autonomous sector constrains growth in demand for livestock and horticulture so much that employment growth is cut way back. Similarly, if high growth rates in the autonomous sector are not balanced by the ability of smallholder livestock and horticulture to respond to that demand growth, employment growth is also very low.

It is notable that in all the cases shown, the overall growth rate is comparably rapid except when autonomous sector growth is very low (5%). That simply reflects the large weight of the autonomous sector in GDP. In this context it is important to emphasize several points about the agricultural sector:



First, the autonomous non-agricultural sector is important to growth of agriculture because of the large size of the horticultural and livestock sectors (in sum more than half the value of agricultural output) and the short run problem that they have very limited export markets. The latter could be because of restrictions to imports from Egypt in the nearby European market, but more likely the constraint lies with policies and institutional structures needed to provide the qualities of products demanded in export markets. Starting from such a small export base (less than 5% for horticulture and essentially none for livestock), many years of rapid growth rates in these sectors will be needed to substantially lessen reliance on the domestic market. The high growth rates of demand for horticultural and livestock products will tax the institutional capacity of the sector to grow. The supply of these products may fail to keep pace with even domestic demand, further limiting export potential.

Second, the GDP tables show that the role of field crops (e.g. wheat, maize, cotton, and rice) is quite modest, even when yields are improving quickly. This occurs because the demand for horticulture and livestock causes farmers to shift land into these activities out of field crops.

Third, Figure 4 suggests that in all but the low agricultural growth scenario, ADNA is very important to overall employment. This sector is one of relatively low-quality goods

and services by international standards. However, Liedholm and Mead note that demand is elastic for these goods and services (as do we from the IFPRI data.) ADNA products may eventually either lose favor or become more tradable as farmers' incomes rise. Until farmer consumption patterns change, however, ADNA will remain an important employer worthy of policy and institutional support.

Fourth, the non-tradable portion of the economy (i.e., the agriculturally related sectors) is large from an employment perspective. It initially encompasses 60% of employment as compared with only 32% of GDP. With high balanced growth, these sectors maintain their combined share of employment even though their share of GDP declines from 32% to 23%. As labor markets tighten and real wage rates rise, several forces will swing into action. In agriculture labor productivity will respond quickly to rising wage rates. Agriculture is notable for the opportunities to increase labor productivity with only small capital investment -that is labor productivity is elastic with respect to the wage rate.

In ADNA, there may well be comparable opportunities for increased labor productivity. For example, machines increase labor productivity in construction markedly. However, where productivity in ADNA does not improve, prices will rise. Farmers will demand those ADNA commodities where labor productivity rises and real prices do not increase markedly. They will also shift to tradable goods. Similarly as incomes rise, higher-quality horticultural and livestock products will be demanded. Thus, the large non-tradable sector will gradually become tradable or be displaced by tradables. Economists have long noted that agriculture declines relatively with economic development. This result holds more generally for the non-tradable sector, which starts out large and declines in relative size as development occurs. An important step on that route is the rapid expansion that creates so much employment when labor absorption is a difficult task.

#### 5. EMPLOYMENT POLICY

Based on the results above, policies to encourage rapid growth in employment must address three equally important dimensions: (1) accelerating the agricultural growth rate, (2) increasing the capacity of the rural and small-town small-scale sector to respond to increased demand from agriculture, and (3) accelerating the growth rate of the autonomous non-agricultural sector which demands agricultural products. With high balanced growth, about one-quarter of employment growth is directly in agriculture and about half in the rural and small-town small-scale sector. The effective demand for the latter sector comes from agriculture. Thus, the first requisite is getting agriculture moving and the second is to encourage a response from the ADNA sector sector.

#### 5.1 Accelerating Agricultural Growth

For Egypt, accelerating agricultural growth has three major components: (1) growth in yields of field crops; (2) growth in horticulture and livestock; and, (3) growth in GDP through rapid growth in the autonomous sector to stimulate demand for livestock and horticultural products.

Maintenance of the existing reformed macroeconomic policy environment will be helpful to all three of the components of accelerated agricultural growth. Additional sector-specific reforms are also very important, as demonstrated in the studies leading up to the Agricultural Policy Reform Project. In the long run, exports should grow to a large component of horticultural production. To do so requires continued policy reform.

Public investment is important to accelerated growth of the agricultural sector because of the small-scale production in agriculture. Investment in public research in the major field crops is important to growth of that sector. Research and extension in the livestock and horticultural sectors are important given their pivotal role in rapid agricultural growth. It is likely that past policy in domestic marketing of horticulture and livestock is constraining production growth, since there is evidence of rising real prices in at least horticulture. Public policy needs to address that issue. Since the dairy subsector is currently substantially small- and medium-scale <sup>13</sup>, particular emphasis needs to be given to expanding that component. And, since women represent the bulk of labor and entrepreneurship in smallholder livestock production, special attention needs to be given to women's participation in marketing, research and extension for livestock. Although probably less dominant, the role of women in horticulture if enhanced would lead to faster growth in that sector.

<sup>&</sup>lt;sup>13</sup> 97% of the animals and 74% of production according to a recent as yet unpublished study conducted by the Reform, Design and Implementation Unit of APRP.

## 5.2 Accelerating Agriculture-Driven Non-Agricultural Production

Studies show that this sector, with its large labor input and small capital requirements responds quickly to increased effective demand (Liedholm and Mead, 1987). Most studies point to credit constraints for the sector, (e.g. Liedholm and Mead., 1987). Also, in the long run a large number of medium-size firms should grow out of this sector if it is to continue rapid growth into the indefinite future (à la Taiwan). That also requires credit programs. Women seem to be substantially represented in this sector, so special effort needs to be made to include them in institutional credit and other programs.

#### 6. CONCLUSIONS

This analysis identifies the employment potential of a good macroeconomic environment that is reinforced by policies and institutions focused on improving the productivity of Egypt's agricultural sector. High growth rates for all of the sectors can provide an annual addition of 924,000 jobs by 2006/07. Sixty-eight percent of those jobs would be in the agricultural and agriculturally driven sectors. For each job directly created in agriculture, the expenditure of the higher agricultural income would create 2.8 jobs in the small-scale enterprises in the rural areas and market towns that make up the ADNA sector. Those indirectly created jobs are three-quarters in consumption goods and services and one-quarter in marketing and input supply channels. That story is consistent with the experience in fast-growth Asian countries.

Such rapid growth in demand for labor would tighten labor markets and push up wage rates. Low-income people will benefit doubly, enjoying more employment at better pay. The combination should increase the economic well-being of the poor immensely.

If, however, overall economic growth slows due to the poor performance of either the agricultural sector or the autonomous non-agricultural sector, job creation would be significantly dampened. Employment growth would fall short of labor force growth, resulting in declining real wages. The poor lose doubly in that situation.

In the case of poor agricultural growth, a failure to provide the necessary policy and institutional reforms, would have a minor impact on overall economic growth (-6%) but a large impact on job creation (-42%). In the case of poor autonomous sector growth, the impact on overall economic growth is far larger (41%), while the impact on employment growth is somewhat lower (-38%). Even in this latter case, most of the lost job potential occurs because the domestic demand for livestock and horticulture slows markedly, thereby slowing the agricultural growth rate and contracting employment growth.

In conclusion, agricultural growth creates jobs and the autonomous non-agricultural sector stimulates agricultural growth. Employment growth in Egypt thus depends on strong growth rates in both the agricultural and non-agricultural sectors of the economy. Policy and institutional reforms must focus on stimulating and maintaining a balanced structure of growth.

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## Appendix A: The Key Data, Derivations and Assumptions

High Balanced Growth Scenario 14

Data	1996/97	2006/07	Comment/Source
GDP growth rate	5.3%	8.2%	1996/97 figure from Institute of National Planning, using Fixed Prices. 2006/07 generated internally based on all the assumptions and dynamics that follow.
Population Growth Rate	2.0%	2.0%	1996/97 growth rates calculated by CAPMAS based on inter-census population estimates. The rate of population growth assumed to remain constant.
Labor Force Growth Rate	2.9%	2.7%	1996/97 figure derived from data from Institute of National Planning. Future labor force growth rate assumed to be equal to the rate of population growth in the 1970-80 inter-census population estimate, when the present entrants to the labor force are presumed to be born.
Agricultural Sector	<b>1</b>		
Ag sector share of GDP	15.7%	11.1%	1996/97 derived from data from Central Bank of Egypt; original data from Ministry of Planning. Final value generated internally.
Ag Sector GDP growth rate	3.4%	4.9%	1996/97 figure derived from Institute of National Planning, using Fixed Prices. 2006/07 generated internally.
Field Crops	<b>1</b>		
Share of Agricultural GDP	47.5%	34.8%	Initial value derived from field crop value added as share of Ag sector net income (net of fish). Source: Central Administration for Agricultural Economics, MALR; final value generated internally
Gross expansion of Cultivated Area	1.69%	1.69%	Estimated from MALR data (Central Administration for Agricultural Economics) for old and new lands from 1991 to 1997. The figure is conservative relative to

<sup>&</sup>lt;sup>14</sup> See Appendix B for the assumptions for the moderate balanced, low agricultural sector and low autonomous sector growth scenarios.

Data	1996/97	2006/07	Comment/Source
			Government plans for future new lands expansion.
Area lost to expanded horticultural and livestock p	roduction		
Increased Yields of Horticultural Crops	0.4%	1.0%	Assumed similar to 'Increased yields/feddan of field crops, below.
Increased Yields of Fodder Crops	0.4%	1.0%	Assumed similar to 'Increased yields/feddan of field crops, below.
Increased Value of Composition of Horticultural Crops	0.0%	2.0%	Justified by low current value due to heavy weight of potatoes and scope to move to higher value crops.
Increased Feeding Efficiency (Livestock)	0.0%	3.0%	Justified by very low current levels and catch-up growth.
Increased Value/feddan of Field Crops	<u>'</u>		
Increased Yields/feddan of Field Crops	0.4%	1.0%	1996/97 figure calculated by MVE Project team from MALR data for old lands in the Nile Valley for 1991-97 for major crops. The 2006/07 figure is two-thirds of the long run US rate of yields increases (of roughly 1.5% per year). Justification: Egypt has agricultural resources which – with proper policy inducement – should be able to generate substantially higher rates of growth, but perhaps not as high as in the US.
Increased Value of Composition of Field Crops	0.0%	0.5%	2006/07 justified on basis of comparative advantage of extra long staple cotton and recent sharp decline in area due to poor policy.
Horticultural Demand	l l		
Share of Agricultural GDP	33.2%	41.3%	Initial value derived from horticultural value added as share of Ag sector net income (net of fish). Source: Central Administration for Agricultural Economics, MALR; final value generated internally
Income Elasticity of Demand for Horticultural Products	.67	.67	Constant throughout period. Estimated from the expenditure elasticities for vegetables and fruits consumed by rural populations (Bouis et al., 1999)
Export share of demand	5%	10.6%	1996/97 figure set as an upper limit based on CAPMAS

Data	1996/97	2006/07	Comment/Source
			export data and MALR production data for potato, tomato, citrus and guava; 2006/07 figure generated internally on the assumption that horticultural exports grow 20% per year.
Export demand growth	20%	10%	Initial high value justified by high comparative advantage, low current base and comparable achievements in other countries. As the export base grows, the rate of expansion will shrink as new markets become increasingly difficult to find.
Livestock Demand			
Share of Agricultural GDP	19.4%	23.9%	Initial value derived from livestock value added as share of Ag sector net income (net of fish). Source: Central Administration for Agricultural Economics, MALR; final value generated internally
Income Elasticity of Demand for Livestock Products	.77	.77	Estimated from the expenditure elasticities for meat and for eggs and milk, averaged across regions, published in Bouis et al. (1999).
Agriculture Driven Non-Agricultural Sector			
Size of sector	16%	12%	Initial value equal to size of agricultural sector based on assumption that the agricultural sector spends half its income in ADNA and that ADNA spends half of its income on itself. See footnotes 2, 3 and 4 for derivation and sources. Subsequent values generated internally.
Growth Rate	4.1%	6.3%	150% of per capita Ag. Sector growth rate plus population growth. See footnote 5 for derivation and sources.
Autonomous Sector			
Size of Sector	69%	77%	1996/97 computed as residual share of economy after agricultural and ADNA sectors are considered. 2006/07 is generated internally based on relative growth rates between sectors.
Autonomous Growth rate	6%	9%	1996/97 computed as residual of total GDP growth of 5.4% minus growth in agricultural and ADNA sectors.

Data	1996/97	2006/07	Comment/Source
			1997/98 through 2006/07 rate of 9% is the assumption that Egypt should be able to attain an autonomous sector growth rate somewhat less than the 10-15% attained by the East Asian Tigers and Southeast Asia at a similar stage of development.
Elasticity of Employment with respect to sector GDP growth	h		
Ag. Sector	.65	.65	Constant throughout period. Computed as the average of several alternative candidate elasticity figures. See footnote 11 for explanation.
Ag-Driven NonAg	.90	.90	Constant throughout period. See footnote 11 for explanation.
Autonomous Sector	.40	.40	Constant throughout period. See footnote 11 for explanation. An employment elasticity of 0.60 was used to validate the model for former periods, reflecting the Government's earlier commitment to hire all graduates into public service.
Share of employment	· ·		
Ag. Sector	26%	23%	Agricultural employment is initially 26% (4.1 million) of total employment based on the results of the 1997 IFPRI household survey (unpublished data) for the proportion of the surveyed population reporting farm production as its principal occupation. Subsequent values generated internally.
Ag-Driven NonAg	34%	37%	Initial assumption of 34% is based on a multiplier of 130% derived from a comparison of incomes per worker and product per worker for categories thought to proxy the agricultural and ADNA sectors, as detailed in footnote 7. Subsequent values generated internally
Autonomous	40%	40%	Computed as the residual of total employment minus employment in the two agriculturally related sectors. Subsequent values generated internally

**Appendix B: Assumptions in the Four Scenarios** 

	High Ba	lanced	Moderate	Balanced	Low Agr	iculture	Low Auto	nomous
	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07	1996/97	2006/07
Growth Rates								
Unconstrained Area	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
Crop, Horticulture and Fodder Yields	0.40%	1.00%	0.40%	0.40%	0.40%	0.40%	0.40%	1.00%
Value of Field Crop Composition	0.01%	0.50%	0.01%	0.01%	0.01%	0.01%	0.01%	0.50%
Value of Hort. Crop Composition	0.01%	2.00%	0.01%	0.01%	0.01%	0.01%	0.50%	2.00%
Livestock Feeding Efficiency	0.01%	3.00%	0.01%	0.01%	0.01%	0.01%	0.50%	3.00%
Demand for Horticultural Exports	20.00%	10.00%	20.00%	10.00%	20.00%	10.00%	20.00%	10.00%
Livestock subsector	generated	generated	generated	generated	3.00%	3.00%	generated	generated
Horticultural subsector	generated	generated	generated	generated	3.00%	3.00%	generated	generated
Autonomous Sector	actual	9.00%	actual	7.00%	actual	9.00%	actual	5.00%
Share Exported								
Horticulture	5%	generated	5%	generated	5%	generated	5%	generated
Elasticities and Multipliers								
Livestock: income elasticity	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Horticulture: income elasticity	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Agric. Employment Elasticity	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
ADNA Employment Elasticity	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Autonomous Empl. Elasticity	0.60	0.40	0.60	0.40	0.60	0.40	0.60	0.40
Share spent by Ag sector on ADNA	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Share spent by ADNA sector on itself	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
ADNA Sector Growth Multiplier	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Ratio ADNA: Ag employment	1.30	generated	1.30	generated	1.30	generated	1.30	generated

## **Appendix C: The Accounting Framework for the High Growth Scenario**

Date			1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
# Years	S		1	2	3	4	5	6	7	8	9	10	11
GDP			5.3%	7.1%	7.4%	7.5%	7.6%	7.7%	7.8%	7.9%	8.0%	8.2%	8.2%
Ac	ctual		5.3%										
Fo	precast			7.1%	7.4%	7.5%	7.6%	7.7%	7.8%	7.9%	8.0%	8.2%	8.2%
Ag	gricultural Sector												
	Agricultural sector contril	oution to Total GDP	0.54%	0.42%	0.48%	0.49%	0.49%	0.49%	0.50%	0.51%	0.52%	0.55%	0.54%
	Ag Sector share of to	tal GDP	15.7%	15.40%	14.77%	14.20%	13.66%	13.15%	12.67%	12.21%	11.79%	11.39%	11.04%
	Actual		15.7%										
	Computed			15.40%	14.77%	14.20%	13.66%	13.15%	12.67%	12.21%	11.79%	11.39%	11.04%
	Forward lookin	g		15.40%	14.77%	14.20%	13.66%	13.15%	12.67%	12.21%	11.79%	11.39%	11.04%
	Numerator			16.21%	15.82%	15.25%	14.69%	14.15%	13.65%	13.17%	12.72%	12.31%	11.94%
	Last per	riod's share		15.67%	15.40%	14.77%	14.20%	13.66%	13.15%	12.67%	12.21%	11.79%	11.39%
	Last per	riod's growth rate		3.43%	2.75%	3.26%	3.44%	3.60%	3.76%	3.95%	4.17%	4.45%	4.83%
	Denominat	or (total of sector shares * growth rates)		105.29%	107.12%	107.39%	107.51%	107.62%	107.72%	107.82%	107.93%	108.05%	108.19%
	Ag Sector Growth Ra	10	3.43%	2.75%	3.26%	3.44%	3.60%	3.76%	3.95%	4.17%	4.45%	4.83%	4.93%
	Ag Sector Growth Ra		3.43%	2.75%	3.26%	3.44%	3.60%	3.76%	3.95%	4.17%	4.45%	4.83%	4.93%
			2.64%	2.75%	3.26%	3.44%	3.60%	3.76%	3.95%	4.17%	4.45%	4.83%	4.93%
	Computed	(	2.04%	2.75%	3.26%	3.44%	3.60%	3.76%	3.95%	4.17%	4.45%	4.83%	4.93%
	Crop Sub Sec		0.150/	0.14%	-0.08%	-0.09%	0.070/	0.030/	0.049/	0.140/	0.31%	0.59%	0.55%
		r contribution to Ag Sector GDP	0.15%				-0.07%	-0.03%	0.04%	0.14%			
		ctor share of Agricultural GDP	47.50%	46.38% 47.65%		43.77% 45.20%	42.23% 43.68%	40.70% 42.16%	39.19% 40.67%	37.74% 39.23%	36.37% 37.88%		
		period's contribution to growth											
		ast period's share		47.50%		45.28%	43.77%	42.23%	40.70%	39.19%	37.74%		
		ast period's growth rate	0.220/	0.32%	0.31%	-0.18%	-0.21%	-0.16% -0.07%	-0.07%	0.09%	0.37%	0.85%	1.67%
		ctor growth rate	0.32%	0.31%	-0.18%	-0.21%	-0.16%		0.09%	0.37%	0.85%	1.67%	1.61%
		re Crop Area	58.40%	57.79%		56.24%	55.29%	54.35%	53.44%	52.57%	51.79%		
		Area growth rate	-0.09%	-0.15%	-0.69%	-0.79%	-0.82%	-0.82%	-0.78%	-0.65%	-0.37%	0.17%	0.11%
		Inconstrained Growth	1.69%	1.69%	1.69% 1.69%	1.69% 1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
		New Lands	1.69%	1.69%			1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
		Rate of expansion	14.08%	12.55%		10.36%	9.54%	8.86%	8.28%	7.77%	7.33%	6.95%	6.61%
		Share of total cropped area	12.00%	13.46%		16.31%	17.71%	19.07%	20.42%	21.74%	23.04%		25.58%
		Old Lands	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
$\vdash$		Rate of expansion	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Share of total cropped area	88.00%	86.54%	85.10%	83.69%	82.29%	80.93%	79.58%	78.26%	76.96%	75.68%	74.42%

Date		1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
# Years		1	2	3	4	5	6	7	8	9	10	11
	Losses in cultivated area under crops	1.78%	1.84%	2.38%	2.48%	2.51%	2.51%	2.47%	2.34%	2.06%	1.52%	1.58%
	% land shifted to horticulture	1.04%	1.07%	1.35%	1.40%	1.42%	1.42%	1.39%	1.33%	1.19%		0.98%
	Rate of area increase in horticulture	4.51%	4.57%	5.67%	5.75%	5.69%	5.57%	5.36%	5.02%	4.44%	3.46%	3.56%
	Total increase in horticultural GDP	4.92%	5.03%	6.20%	6.35%	6.40%	6.43%	6.44%	6.45%	6.46%		6.56%
	Increase in value/ha in horticulture	0.41%	0.46%	0.52%	0.60%	0.71%	0.86%	1.08%	1.43%	2.01%		3.00%
	Yields growth rate	0.40%	0.44%	0.49%	0.54%	0.60%	0.67%	0.74%	0.82%	0.90%		1.00%
	Value of composition growth rate	0.01%	0.02%	0.03%	0.06%	0.11%	0.19%	0.34%	0.62%	1.11%		2.00%
	Horticulture as share of total cropped are	23.00%	23.39%	23.79%	24.32%	24.87%	25.41%	25.93%	26.43%	26.89%		
	% land shifted to livestock	0.75%	0.77%	1.03%	1.08%	1.10%	1.10%	1.08%	1.01%	0.87%		0.60%
	Rate of area increase in livestock	4.03%	4.08%	5.42%	5.54%	5.52%	5.43%	5.22%	4.83%	4.07%		2.77%
	Total increase in livestock GDP	4.44%	4.54%	5.95%	6.15%	6.25%	6.33%	6.41%	6.49%	6.57%	6.66%	6.77%
	Increase in value/ha in livestock	0.41%	0.46%	0.53%	0.61%	0.73%	0.90%	1.18%	1.66%	2.49%		4.00%
	Yields growth rate (fodder crops)	0.40%	0.44%	0.49%	0.54%	0.60%	0.67%	0.74%	0.82%	0.90%		1.00%
	Feeding efficiency	0.01%	0.02%	0.04%	0.07%	0.13%	0.24%	0.45%	0.84%	1.59%		3.00%
	Fodder as share of total cropped area	18.60%	18.83%	19.06%	19.44%	19.84%	20.24%	20.63%	21.00%	21.32%		
	Value per ha	0.41%	0.46%	0.51%	0.58%	0.66%	0.75%	0.87%	1.03%	1.23%		1.50%
	Yields growth rate	0.40%	0.44%	0.49%	0.54%	0.60%	0.67%	0.74%	0.82%	0.90%		1.00%
	Value of Composition growth rate	0.01%	0.02%	0.02%	0.04%	0.06%	0.09%	0.14%	0.21%	0.32%		0.50%
	Horticulture Sub Sector	0.0.70	0.0270	0.0270	0.0.70	0.007.0	0.0070	011.170	512.77	0.02,0		
	Horticulture sector contribution to Ag Sector GDP	1.63%	1.71%	2.15%	2.26%	2.34%	2.42%	2.49%	2.55%	2.61%	2.66%	2.74%
	Horticultural sector share of Agricultural GDP	33.20%	33.90%	34.66%	35.64%	36.64%	37.64%	38.60%	39.53%	40.40%		
	This period's contribution to growth	00.2070	34.83%	35.61%	36.80%	37.90%	38.99%	40.05%	41.09%	42.08%		
	Last period's share		33.20%	33.90%	34.66%	35.64%	36.64%	37.64%	38.60%	39.53%		
	Last period's growth rate		4.92%	5.03%	6.20%	6.35%	6.40%	6.43%	6.44%	6.45%		
	Growth Rate	4.92%	5.03%	6.20%	6.35%	6.40%	6.43%	6.44%	6.45%	6.46%		6.56%
	Contribution of domestic demand to total	3.92%	3.97%	5.09%	5.22%	5.26%	5.29%	5.32%	5.35%	5.39%		5.50%
	Domestic demand growth rate	4.12%	4.21%	5.44%	5.62%	5.70%	5.77%	5.84%	5.91%	5.98%		6.15%
	population growth rate	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%		
	income effect	2.10%	2.19%	3.42%	3.59%	3.68%	3.75%	3.82%	3.88%	3.96%		4.13%
	per capita income growth (previous year)	3.13%	3.27%	5.10%	5.36%	5.49%	5.59%	5.70%	5.80%	5.90%		6.16%
	income growth (last period GDP)	5.16%	5.29%	7.12%	7.39%	7.51%	7.62%	7.72%	7.82%	7.93%		8.19%
	population growth rate	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%		2.02%
	income elasticity for horticultural product	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
	Domestic share of total demand	95.00%	94.28%	93.55%	92.88%	92.24%	91.64%	91.07%	90.56%	90.10%		
	Contribution of export demand to total	1.00%	1.06%	1.11%	1.13%	1.14%	1.14%	1.12%	1.10%	1.07%		1.07%
	Export demand growth rate	20.00%	18.52%	17.14%	15.87%	14.70%	13.61%	12.60%	11.67%	10.80%		
	Export share of total demand	5.00%	5.72%	6.45%	7.12%	7.76%	8.36%	8.93%	9.44%	9.90%	10.31%	
			0.1.2,0	0.1070			0.007	0.007,0				
	Livestock Sub Sector											
	Livestock sector contribution to Ag Sector GDP	0.86%	0.90%	1.19%	1.27%	1.32%	1.37%	1.42%	1.47%	1.53%	1.58%	1.63%
	Livestock sector share of Agricultural GDP	19.40%	19.72%	20.06%	20.59%	21.13%	21.67%	22.20%	22.73%	23.24%	23.71%	24.12%
	This period's contribution to growth		20.26%	20.62%	21.26%	21.85%	22.45%	23.04%	23.63%	24.21%		
	Last period's share		19.40%	19.72%	20.06%	20.59%	21.13%	21.67%	22.20%	22.73%	23.24%	23.71%
	Last period's growth rate		4.44%	4.54%	5.95%	6.15%	6.25%	6.33%	6.41%	6.49%		6.66%
	Growth Rate	4.44%	4.54%	5.95%	6.15%	6.25%	6.33%	6.41%	6.49%	6.57%		6.77%
	Population growth rate	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%		2.02%
	Income effect	2.41%	2.52%	3.93%	4.13%	4.22%	4.31%	4.39%	4.46%	4.55%		4.75%
	per capita income growth (previous year)	3.13%	3.27%	5.10%	5.36%	5.49%	5.59%	5.70%	5.80%	5.90%		6.16%
	income growth (last period GDP)	5.16%	5.29%	7.12%	7.39%	7.51%	7.62%	7.72%	7.82%	7.93%		
	population growth rate	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%		2.02%
	income elasticity for meat	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77

ite		1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
Years		1	2	3	4	5	6	7	8	9	10	11
Agricul	turally Driven Non-Agriculture (ADNA) Sector											
ADN	IA sector contribution to Total GDP	0.65%	0.48%	0.58%	0.60%	0.61%	0.63%	0.65%	0.67%	0.71%	0.76%	0.76%
A	DNA Sector share of total GDP	15.67%	15.50%	14.92%	14.43%	13.98%	13.56%	13.17%	12.81%	12.49%	12.22%	12.00%
	Historic: Based on Multiplier from Ag	15.67%										
	Ag sectors spends on ADNA	7.84%										
	Multiplier	50.00%										
	Ag Sector share of total GDP	15.67%										
	ADNA spends on self	7.83%										
	Multiplier	50.00%										
	Rounds											
	Round 1	3.92%										
	Round 2	1.96%										
	Round 3	0.98%										
	Round 4	0.49%										
	Round 5	0.24%										
	Round 6	0.12%										
	Round 7	0.06%										
	Round 8	0.03%										
	Round 9	0.02%										
	Round 10	0.01%										
	Round 11	0.00%										
	Predicted: Based on sector growth rates		15.50%	14.92%	14.43%	13.98%	13.56%	13.17%	12.81%	12.49%	12.22%	12.009
	Forward looking		15.50%	14.92%	14.43%	13.98%	13.56%	13.17%	12.81%	12.49%	12.22%	12.009
	Numerator		16.32%	15.98%	15.49%	15.03%	14.59%	14.18%	13.81%	13.48%	13.20%	12.989
	Last period's share		15.67%	15.50%	14.92%	14.43%	13.98%	13.56%	13.17%	12.81%	12.49%	12.229
	Last period's growth rate		4.14%	3.11%	3.88%	4.15%	4.38%	4.63%	4.91%	5.24%	5.66%	6.239
	Denominator (total of sector shares * growth rates)		105.29%	107.12%	107.39%	107.51%	107.62%	107.72%	107.82%	107.93%	108.05%	108.199
A	DNA Sector Growth Rate	4.14%	3.11%	3.88%	4.15%	4.38%	4.63%	4.91%	5.24%	5.66%	6.23%	6.389
	Population Growth Rate, current period	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.029
	Increased demand for ADNA	2.11%	1.08%	1.85%	2.12%	2.36%	2.61%	2.88%	3.21%	3.63%	4.21%	4.359
	Per Capita Ag Sector Growth Rate	1.41%	0.72%	1.24%	1.42%	1.57%	1.74%	1.92%	2.14%	2.42%	2.80%	2.909
	Ag Sector Growth Rate (actual/computed)	3.43%	2.75%	3.26%	3.44%	3.60%	3.76%	3.95%	4.17%	4.45%	4.83%	4.939
	Population Growth Rate	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.02%	2.029
	Multiplier	150.00%	150.00%	150.00%	150.00%	150.00%	150.00%	150.00%	150.00%	150.00%	150.00%	150.00
	mous Sector											
Auto	nomous Sector Contribution to total GDP	4.11%	6.22%	6.33%	6.42%	6.51%	6.60%	6.67%	6.75%	6.81%	6.87%	6.939
A	autonomous Sector share of total GDP	68.66%	69.11%	70.32%	71.37%	72.36%	73.29%	74.16%	74.97%	75.72%	76.39%	76.969
	Derived from residual (ag, adna, 100%)	68.66%										
	Predicted: Based on sector growth rates		69.11%	70.32%	71.37%	72.36%	73.29%	74.16%	74.97%	75.72%	76.39%	76.96
	Forward Looking		69.11%	1 1 11	71.37%	72.36%	73.29%	74.16%	74.97%	75.72%	76.39%	76.96
	Numerator		72.77%		76.65%	77.80%	78.87%	79.89%	80.84%	81.72%	82.53%	83.26
	Last period's share		68.66%		70.32%	71.37%	72.36%	73.29%	74.16%	74.97%	75.72%	76.39
	Last period's growth rate		5.98%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00
	Denominator (total of sector shares * growth rates)		105.29%		107.39%	107.51%	107.62%	107.72%	107.82%	107.93%	108.05%	108.19
A	autonomous Sector Growth Rate	5.98%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.009
	Past: Derived from GDP data (residual of total-ag-adna)	5.98%										
	Future: Based on assumed total growth rate		9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.009

Date	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
#Years	1	2	3	4	5	6	7	8	9	10	11
Annual Employment											
Total Labor Force (000)	17358	17827	18308	18802	19310	19831	20367	20917	21481	22061	22657
Actual	17358										
Projected based on pop growth rate of 2.7 for early 80s		17827	18308	18802	19310	19831	20367	20917	21481	22061	22657
Total Employment (000)	15825	16277	16795	17349	17938	18567	19241	19966	20754	21626	22550
Actual	15825										
Computed, based on subsectors/elasticity method	15825	16277	16795	17349	17938	18567	19241	19966	20754	21626	22550
	100.0%										
Annual Increment Annual Increment											
Actual	485										
Computed, based on subsectors/elasticity method	502	452	518	554	590	629	673	725	789	872	924
Rate of Growth of Total Employment											
Actual	3.2%										
Computed, based on subsectors/elasticity method	3.3%	2.9%	3.2%	3.3%	3.4%	3.5%	3.6%	3.8%	3.9%	4.2%	4.3%
Agricultural Employment											
Annual Increment	90	73	89	96	102	109	118	127	140	156	164
Total Ag employment (000)	4115	4188	4277	4372	4474	4584	4701	4829	4968		
Ag Employment (000), partitioned	4115			.0.2				.020		0.2.	0200
Ag Sector's share of Total Employed	26.0%										
Total Employed (000)	15825										
Ag Emp this period, elasticities method	13023	4188	4277	4372	4474	4584	4701	4829	4968	5124	5288
Ag. Employment (next/last period) (000)		4115	4188	4277	4372	4474	4584	4701	4829		
% increase in ag sector employment	2.2%	1.8%	2.1%	2.2%	2.3%	2.4%	2.6%	2.7%	2.9%		
Ag GDP growth rate (current period)	3.4%	2.7%	3.3%	3.4%	3.6%	3.8%	3.9%	4.2%	4.4%		
Ag sector employment elasticity	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%	
Ag sector employment elasticity	0076	0070	0570	05/6	0570	0576	0070	0070	0070	0070	0070
ADNA Sector Employment											
Annual Increment (000)	192	150	192	212	233	256	282	315	356	412	445
Total ADNA Employment (000)	5349	5498	5690	5903	6136	6391	6674	6988	7344		
ADNA Employment (000) ADNA Employment (000), partitioned	5349	5490	3690	5905	0130	6391	0074	0900	7344	1130	0201
ADNA Share of Total Employed	33.8% 130%										
Ratio ADNA employment to Ag employment  Ag Sector's share of Total Employed	26.0%										
Total Emploved (000)  ADNA Empl. This period, elasticities method	15825	5498	5690	5903	0400	6391	6674	6988	7344	7756	8201
ADNA Employment (next/last period) (000)		5349	5498	5690	6136 5903	6136	6391	6674			
, , , , , , , ,	2.70/										
% increase in ag sector employment	3.7%	2.8%	3.5%	3.7% 4.1%	3.9%	4.2%	4.4%	4.7%	5.1%		
ADNA GDP growth rate (current period)	4.1%	3.1%	3.9%		4.4%	4.6%	4.9%	5.2%	5.7%		
ADNA employment elasticity	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Automorphic Control											
Autonomous Sector	000	200	007	0.40	055	20.4	070	000	000	20.4	045
Annual Increment	220	229	237	246	255	264	273	283	293		
Total Auton. Employment (000)	6362	6591	6828	7074	7328	7592	7866	8149	8442	8746	9061
Auton. Employment (000), partitioned	6362										-
Autonomous Sector's share of Total Employed	40.2%										
Total Employed (000)	15825										
Auton. Emp this period, elasticities method	6362	6591	6828	7074	7328	7592	7866	8149			
Auton. Employment (next/last period) (000)	6141	6362	6591	6828	7074	7328	7592	7866			
% increase in ag sector employment	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%		
Auton. GDP growth rate (current period)	6.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%		
Autonomous employment elasticity	60.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%